Claims

1. A method of estimating a process efficiency of a dialysis system comprising a dialyzer (130) and a patient (120), where the patient's blood system is connected to the dialyzer (130) such that the dialyzer (130) performs a dialysis treatment of the patient (120), the dialyzer (130) having a potential cleaning capacity (K_{eff}, K), **characterized by** the step of:

determining a whole body clearance ratio (K_{wb}/K_{eff}, K_{wb}/K) which expresses how well the patient (120) responds to the potential cleaning capacity (K_{eff}, K).

2. A method according to claim 1, **characterized by** determining the whole body clearance ratio (K_{wb}/K_{eff}, K_{wb}/K) by:

measuring a final blood urea concentration no later than approximately one minute after the end of the treatment,

measuring an equilibrated blood urea concentration no earlier than approximately one half hour after the end of the treatment, and

dividing said final blood urea concentration by said equilibrated blood urea concentration.

3. A method according to claim 2, **characterized by** measuring the final blood urea concentration directly after the end of the treatment to obtain the whole body clearance ratio (K_{wb}/K) in respect of a dialyzer clearance (K).

4. A method according to claim 2, **characterized by** measuring the final blood urea concentration approximately one minute after the end of the treatment to obtain the whole body clearance ratio (K_{wb}/K_{eff}) in respect of an effective clearance (K_{eff}).

5. A method according to claim 1, **characterized by** determining the whole body clearance ratio (K_{wb}/K_{eff}, K_{wb}/K) by:

measuring an initial urea concentration (C_{d0}; C_{b0}),

measuring, during the treatment at occasions being well spaced in time at least two subsequent urea concentration values after the treatment has started, a first value of said at least two values being measured no earlier than approximately one half hour after the treatment has started,

deriving a starting urea concentration based on an extrapolation in time of said at least two values back to the start of the treatment, and

dividing said starting urea concentration by said initial urea concentration (C_{d0}; C_{b0}).

6. A method of estimating a whole body clearance ratio (K_{wb}/K_{eff}) of a dialysis treatment of a patient (120), the whole body clearance ratio (K_{wb}/K_{eff}) expressing how well the patient (120) responds to a potential cleaning capacity (K_{eff}) of a dialyzer (130) which performs the treatment, **characterized by** determining the whole body clearance ratio (K_{wb}/K_{eff}) based on a measurement of a slope (K_{wb}/V) of a logarithmic removal rate function (C_d, C_b) which describes how a urea concentration is lowered in course of the treatment.

7. A method according to claim 6, **characterized by** the steps of:

determining an initial dialysate urea concentration (C_{d0}),

determining a total flow rate (Q_d) of spent dialysate during the treatment including any ultrafiltration,

calculating, based on measurements performed during a steady state phase (t_3 - t_4) of the treatment, the slope (K_{wb}/V) of said logarithmic removal rate function (C_d),

measuring a predialysis urea mass (m_0) in the patient (120), and

determining the whole body clearance ratio (K_{wb}/K_{eff}) as the product of said slope (K_{wb}/V) and said predialysis urea mass (m_0), divided by said flow rate (Q_d) and divided by said initial urea concentration (C_{d0}).

8. A method according to claim 6, **characterized by** the steps of:

calculating, based on measurements performed during a steady state phase (t_3 - t_4) of the treatment, the slope (K_{wb}/V) of said logarithmic removal rate function (C_d; C_b),

determining an entire distribution volume (V), and

determining the whole body clearance ratio (K_{wb}/K_{eff}; K_{wb}/K) as the product of said slope (K_{wb}/V) and said entire distribution volume (V) divided by the potential cleaning capacity (K_{eff}; K).

9. A method according to any one of the claims 7 or 8, **characterized by** performing the measurements of the slope (K_{wb}/V) of said logarithmic removal rate function (C_d) on a dialysate side of a dialysis system comprising the dialyzer (130) and the patient (120).

10. A method according to claim 8, **characterized by** performing the measurements of the slope (K_{wb}/V) of said logarithmic removal rate function (C_b) on a blood side of a dialysis system comprising the dialyzer (130) and the patient (120).

11. A computer program directly loadable into the internal memory of a computer, comprising software for controlling the steps of any of the claims 1 to 5 when said program is run on the computer.

12. A computer readable medium, having a program recorded thereon, where the program is to make a computer control the steps of any of the claims 1 to 5.

13. A computer program directly loadable into the internal memory of a computer, comprising software for controlling the steps of any of the claims 6 to 10 when said program is run on the computer.

14. A computer readable medium, having a program recorded thereon, where the program is to make a computer control the steps of any of the claims 6 to 10.

15. A method of performing a dialysis treatment program with respect to a patient (120) by means of a dialyzer (130), the program comprising repeated dialysis treatments, **characterized by**

performing a first dialysis treatment of the patient (120) under a first set of conditions which include at least one of a treatment time and a composition of the dialysate in the dialyzer (130),

estimating, in course of the first dialysis treatment, a whole body clearance ratio (K_{wb}/K_{eff}, K_{wb}/K) according to any of the claims 2 to 5, or any one of the claims 6 to 10,

comparing the whole body clearance ratio (K_{wb}/K_{eff}, K_{wb}/K) with a threshold ratio, and if the whole body clearance ratio (K_{wb}/K_{eff}, K_{wb}/K) is less than the threshold ratio

performing a dialysis treatment of the patient (120) after said first dialysis treatment under a second set of conditions which are different from the first set of conditions.

16. An apparatus (210) adapted to estimate a whole body clearance ratio of a dialysis treatment of a patient (120), the whole body clearance ratio expressing how well the patient (120) responds to a potential cleaning capacity of a dialyzer (130) which performs the treatment, the apparatus (210) comprising:

a urea monitor circuit (211) adapted to: determine an initial dialysate urea concentration (C_{d0}); determine a total flow rate (Q_d) of spent dialysate during the treatment including any ultrafiltration; measure, during a steady state phase (t_3 - t_4) of the treatment, a slope (K_{wb}/V) of a removal rate function which describes how a dialysate urea concentration is lowered in course of the treatment; and measure a predialysis urea mass (m_0) in the patient (120), and

a processor (212) adapted to determine the whole body clearance ratio (K_{wb}/K_{eff}) for the patient (120), the whole body

clearance ratio (K_{wb}/ K_{eff}) being determined as the product of said slope (K_{wb}/V) and said predialysis urea mass (m_0), divided by said flow rate (Q_d) and divided by said initial dialysate urea concentration (C_{d0}).

17. Use of the apparatus (210) according to the claim 16 for estimating a whole body clearance ratio of a dialysis treatment of a patient (120).